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Rosenberger, J.; van Dijk, J.P.; Nagyova, I.; Zezula, I.; Geckova, A.M.; Roland, R.; van den Heuvel, W.J.A.; Groothoff, J.W.

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Predictors of Perceived Health Status in Patients after Kidney Transplantation

Jaroslav Rosenberger,[1,2,3,8] Jitse P. van Dijk,[3,4] Iveta Nagyova,[3] Ivan Zezula,[5] Andrea Madarasova Geckova,[3] Robert Roland,[1,2] Wim J. A. van den Heuvel,[6,7] and Johan W. Groothoff[4]

Background. Patients after kidney transplantation have decreased mortality, morbidity and better quality of life compared to people on dialysis. Major efforts are being directed towards research into graft and patient survival. Research into quality of life is less intensive. The aim of this study was to explore the predictors of perceived health status (PHS) in kidney transplant recipients.

Methods. Out of 218 patients after kidney transplantation 138 participated in the study. Linear regression analysis was performed to predict PHS, measured with the SF-36 questionnaire, in three age categories (<40, 40–59, ≥60 years). Independent variables included social support (measured with the Social Support List Discrepancies questionnaire), sociodemographic and medical variables, side effects and compliance.

Results. Predictors of better PHS in patients <40 years were better social support ($P \leq 0.001$), lower creatinine ($P \leq 0.001$) and lower stress from adverse effects ($P \leq 0.001$). In the group of patients aged 40–59 years higher education ($P \leq 0.05$), increased housekeeping activities ($P \leq 0.01$) and lower stress from adverse effects ($P \leq 0.001$) predicted better PHS. In the last age group predictors of better PHS were lower rate of dialysis ($P \leq 0.05$) and posttransplant hospitalizations ($P \leq 0.01$), absence of diabetes mellitus ($P \leq 0.01$) and lower stress from adverse effects ($P \leq 0.05$).

Conclusions. Major differences exist in PHS among kidney transplant recipients depending on their age. Side effects of therapy are the most important predictor of PHS for all age groups. PHS of young patients mostly depends on their renal function and their social support. Education and working activities are most important for middle-aged people whereas in older patients PHS is mostly affected by comorbidity.

Keywords: Quality of life, Perceived health status, Kidney transplantation, SF-36.

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At the present time increasing attention is being paid to quality of life evaluation. Together with mortality, morbidity and cost utilization it has become one of the major indicators of medical care (*1*). Many factors are known to be predictors of morbidity and mortality in dialyzed and transplanted patients. Less information is available about those variables that have an impact on quality of life.

Quality of life according to the World Health Organization (WHO) definition is a multidimensional construct comprising physical, mental, social and economic components (*2*). Due to the complexity of each domain and depending on the method of evaluation there are many variables identified as predictors of good or bad quality of life, including demographic, psychosocial and medical parameters (*3*). Quality of life is an umbrella term and is often interchanged with perceived health status, functional status, self-rated health or health-related quality of life. This is the source of frequent problems in this field as definitions and measures for quality of life and the related terms are not clear. Many researchers therefore focus their research involving evaluation of the impact of disease and health on quality of life, and they use the term "health-related quality of life", while others refuse such simplification and prefer the term "perceived health status" (*4*). Both terms are interchanged frequently, meaning the same—they evaluate mainly the functional (physical) and mental status of patients as the reflection of their disease. Despite the uncertainty in definitions, health-related quality of life or perceived health status is not a mere construct devoid of clinical relevance. Recent research has shown that it is a very important predictor of other outcomes in patients with chronic renal disease (*5–6*).

Research into perceived health status in patients after kidney transplantation is broad, but mostly limited to the description or analysis of its determinants using univariate statistics. Studies with more proper analysis of predictive variables are unfortunately scarce. Searching the literature, we identified ten such studies (*7–16*). Their results are heterogenous depending on study design, composition of the target population and explored variables. Age is the best explored variable, and the majority of studies found higher age to be the most important negative predictor of perceived health status (*7–11*). The results are less clear for gender because only the study made by Wight et al., who compared cohorts of 292 dialysis and 228 transplanted patients, found female gender to be connected with worse physical function-

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[1] Nephrology and Dialysis Center, Kosice, Slovak Republic.
[2] Transplantation Department, University Hospital, Kosice, Slovak Republic.
[3] Kosice Institute for Society and Health, Institute of Social Sciences, Faculty of Science, University of PJ Safarik, Kosice, Slovak Republic.
[4] Department of Social Medicine, University Medical Center Groningen, University of Groningen, the Netherlands.
[5] Institute of Mathematics, Faculty of Science, University of PJ Safarik, Kosice, Slovak Republic.
[6] Institute for Rehabilitation Research, Hoensbroek, the Netherlands.
[7] Department of Medical Sociology, University of Maastricht, the Netherlands.
[8] Address correspondence to: Jaroslav Rosenberger, M.D., Nephrology and Dialysis Center Kosice, Transplantation Department, University Hospital, Tr. SNP 1, 040 11 Kosice, Slovak Republic.
E-mail: rosenberger_jaro@hotmail.com

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ing in kidney transplant recipients (*7*). Race is not a frequently reported variable as only a few multiethnic studies have been performed in this field, all showing white race associated with better results (*11–13*). Similarly only a few studies have explored socio-economic variables. Hathaway et al. confirmed that higher education and employment status predict better results in the Sickness Impact Profile, Ferran's and Power's QoL Index and Adult Self-Image Scales questionnaires (*9*). Crom et al. found higher education to be associated with better psychological score (*13*). Griva et al. used the SF-36 questionnaire and found higher income to be a predictor of a better mental component (*8*). Two studies explored the impact of social support on perceived health status and found it to be an important predictor of psychological health status (*9*, *13*). Medical variables are at the center of attention and most research papers include them. Surprisingly only two studies explored the impact of side effects of treatment and reported them to be predictors of poor health status (*14–15*). Fujisawa et al. found serum creatinine to be the only predictor of results in physical functioning general health perceptions and vitality scales of the SF-36 questionnaire (*16*). Many researchers have found co-morbid conditions including anemia, diabetes mellitus, hypertension, joint and eye diseases, to be associated with poor health status (*7–11*, *13*, *14*). In addition, length of hospital stay, number of hospitalizations and time on dialysis, which reflect morbidity, have also been found to have impact on perceived health status (*8*, *9*, *13*).

The aim of this study is to explore predictors of perceived health status depending on age in patients after kidney transplantation. A wide range of variables is analyzed with the aim of merging the importance of medical and non-medical factors, including demographic, socio-economic variables, social support, dialysis and transplantation factors, side-effects of immunosuppression and compliance with the treatment. In addition, the authors discuss the clinical importance of medical and non-medical predictors of perceived health status and the consequences for possible interventions.

MATERIALS AND METHODS

Patients

Out of 218 patients with a functioning graft after kidney transplantation from two transplant centers in Slovakia, 208 agreed to participate in the study and 138 sufficiently completed the given questionnaires (effective response rate 63.3%). Nonresponders did not differ significantly from the analyzed group whether in age, gender, education or employment status. All patients after the third month and before 7 years posttransplantation were asked to participate, with the exception of those with severe dementia or mental retardation. The lower limit of three months was chosen as it is a common period for short-term evaluations (*8–10*, *14*). Two, five, or 10 years are usually used for long-term evaluations. As the aim of this study was to study approximately 200 patients, the upper limit was set at 7 years after transplantation after considering the number of patients in our transplant centres. All patients signed an informed consent before the interview. The local ethical committee approved the study.

Procedures and Measures

Patients were interviewed by an independent observer in a structured interview, which focused on basic demographic information, education, employment status, housekeeping activities, family life, social activities, dialysis history, compliance with immunosuppressive treatment and adverse effects of immunosuppression.

Age, gender, education (elementary, secondary and university), employment status (employed full-time or part-time, not employed—disabled, retired or unemployed) and house-keeping activities (measured in hours per week spent shopping, cooking, cleaning, or caring for family members) were socio-demographic variables.

Patients completed the Short Form Health Survey (SF-36) and Social Support List Discrepancies questionnaire (SSL-D). The SF-36 is a 36-item questionnaire for assessment of perceived health status (*17*). It consists of eight subscales which can be combined as the physical summary component and the mental summary component. All subscales as well as the summary components are presented as scores between 0 and 100 with higher scores indicating better health status. The validity and reliability of SF-36 have been tested in patients with renal disease including those after kidney transplantation (*6*, *7*, *16*, *18*). Skalska et al. validated the questionnaire in the Czech population (*19*). The Cronbach α in the present sample was 0.95, while the Cronbach α for each subscale varied between 0.77 (for social functioning) and 0.91 (for physical functioning). For the purposes of this study only summary component scores were used.

SSL-D is an instrument designed for assessment of social support (*20*). The items in this questionnaire are grouped into 6 scales and they can be computed into a summary score (higher score indicates better social support). The validity and reliability of this questionnaire have been previously tested in various patient populations (*21–23*). The Cronbach α of the questionnaire in the research we performed was 0.89. For the purposes of this study only the SSL-D sumscore was used.

Information about medical variables was mostly taken from patients' medical records. Dialysis variables were as follows: duration of dialysis period (in years), number of hospitalizations during dialysis period and number of operations during dialysis period. Transplantation variables were as follows: serum creatinine (SCr), time since transplantation (in months), number of hospitalizations after transplantation, number of operations after transplantation and type of immunosuppression protocol. Presence of diabetes mellitus was used as a measure of co-morbidity.

Patients were asked to select from the list of 16 various adverse effects of immunosuppression during the interview (malaise, pain, muscle weakness, weight gain, facial changes, depression, anxiety, sleep disorders, gingival hyperplasia, leg edemas, skin lesions, hair loss, facial edemas, sexual dysfunction, diarrhea, fragile skin). Stress from each of these adverse effects of immunosuppression was measured on a 5-point scale (0: no stress, 1: low stress, 2: moderate stress, 3: high stress, 4: very high stress). For each patient a total score of all adverse effects was calculated as the sum of scores in all items.

Compliance with the immunosuppression therapy was measured on a 5-point scale: 1: excellent, hardly ever modify

the treatment (no more than once per last month); 2: good, rarely modify the treatment (2–3× per last month); 3: average, sometimes modify the treatment (once a week); 4: fair, often modify the treatment (more than once a week), 5: bad, always modify the treatment. Modification of treatment was explained as missing a dose, prolonging the intervals between doses by more than two hours or changing the dose of immunosuppressants. The nephrologist was interviewed about each patient's compliance with the immunosuppression therapy using the same scale as well. No specific single method was imposed on the nephrologist to identify noncompliance. Nephrologists mostly based their opinion on cyclosporin level variations or knowledge about prescribed and used immunosuppressants. Patients were considered to be compliant only if they declared their compliance by themselves as excellent, in accord with their physician's opinion.

Statistics

Stepwise multiple linear regression analysis was performed in order to find predictors of perceived health status. Physical and mental component summary scores of the SF-36 were entered as the dependent variables. The model of independent variables consisted of socio-demographic variables, social support (SSL-D sumscore), dialysis variables, transplantation variables, co-morbidity, sum score of stress from side-effects of immunosuppression and compliance with the immunosuppressive medication. The analysis was performed with the sample divided into three age categories—patients aged less than 40 years, patients between 40 and 59 years and patients over 60 years. The cutoff values were selected based on data distribution and information from the literature.

SPSS 10.0 was used for statistical analyses.

RESULTS

Mean age was 48.4±11.9 years and male/female ratio was 1.55. The majority of patients had a good graft function with median of serum creatinine 133 μmol/L (1.5 mg/dl). The predominant immunosuppressive protocol consisted of cyclosporin, mycophenolate mofetil and prednisone. More detailed description of the patient sample is given in Tables 1 and 2.

The results of multiple linear regression analyses of predictors of perceived health status are presented in Tables 3–5. Only the models with the best explanation of variance in the mental and physical components of perceived health status are presented.

Better social support and fewer side-effects of immunosuppression predicted a better mental component of perceived health status in patients younger than 40 years. Better social support and lower SCr predicted a better physical component of perceived health status in this age group (Table 3).

Completely different results were found in the group of middle-aged patients (between 40 and 59 years). Higher education, increased housekeeping activities and lower stress from adverse effects of immunosuppression predicted better perceived health status (Table 4).

In the last age group (patients aged 60 years and older) the mental component of perceived health status was positively associated with lower posttransplant morbidity represented by lower posttransplant hospitalization rate, absence of diabetes mellitus and fewer side effects of immunosuppression. Similarly, the physical component was positively associated with lower dialysis hospitalization rate and fewer side effects of immunosuppression (Table 5).

TABLE 1. Demographic, social and social support characteristics of the patient sample (N=138)

Variable	% or mean, SD (range)
Gender	
male	60.9%
female	39.1%
Age	48.4±11.9 years (18–74)
<40 years	20.9%
40–59 years	60.4%
≥60 years	18.7%
Education	
elementary	15.3%
secondary	77.4%
university	7.3%
Housekeeping activities	24.3±18.5 hours/week
Occupational status	
full-time job	8.7%
part-time job	1.5%
disabled, retired or unemployed	89.8%
Family status	
single	21.5%
married	67.4%
divorced	5.9%
widowed	5.2%
Social support (SSL-D questionnaire)	
everday emotional support	9.3±2.1 (4–16)
emotional support with problems	17.7±3.8 (8–32)
esteem support	13.0±2.8 (6–24)
social companionship	10.5±2.7 (5–20)
social support sumscore	50.4±9.0 (23–92)

DISCUSSION

The aim of this study was to detect the most relevant bio-psycho-social predictors of perceived health status in kidney transplant recipients. Based on literature search and our previous experience (*24*), the presented models were created.

Age is the most important variable when considering perceived health status in kidney transplant recipients (*8–10, 24–26*). We decided therefore to analyze patients separately in three different age groups (less than 40, 40–59 and more than 60 years). In all groups both medical and non-medical variables play an important role.

Perceived health status in young patients is mostly influenced by their social support, renal function and side-effects of immunosuppression. The models give an excellent explanation of variance in perceived health status (60.7% for the mental and 78.3% for the physical component). The study by Hathaway et al. with 91 patients with mean age 39.2 years found social support to be the most important predictor of all measures in the Sickness Impact Profile questionnaire (*9*).

TABLE 2. Medical characteristics of the patient sample (N=138)

Variable	% or mean, SD (range)
Organ donor	
cadaveric	96.3%
living	3.7%
Dialysis before transplantation	
hemodialysis	74.3%
peritoneal dialysis	14.0%
both	11.7%
Time since transplantation	34.11±24.6 months
Primary kidney disease	
glomerulonephritis	43.5%
tubulointerstitial nephritis	23.2%
polycystic kidneys	5.1%
diabetes mellitus	3.6%
congenital diseases	2.9%
systemic diseases, vasculitis	2.2%
other or unknown causes	19.6%
Immunosuppression protocol	
Pred+CsA+Aza	12.8%
Pred+CsA	13.5%
Pred+CsA+MMF	40.6%
Pred+Tac+MMF	9.0%
CsA+Aza	3.8%
CsA+MMF	10.5%
Tac+MMF	0.8%
CsA	8.3%
Tac	0.8%

Pred, prednisone; CsA, cyclosporin A; Aza, azathioprine; MMF, mycophenolate mofetil; Tac, tacrolimus.

TABLE 3. Multiple linear regression analysis of predictors of perceived health status in age group <40 years

	Mental component		Physical component	
Preditors	R^2	β, P	R^2	β, P
	60.7%		78.3%	
Employment status				−0.123
Social support		0.570***		0.412***
SCr				−0.876***
Side effects of IS		−0.550***		

SCr , serum creatinine; IS, immunosuppression.
*** $P \leq 0.001$.

Fujisawa et al. published their study based on 117 kidney transplant recipients with ages similar to our "young patients group". They found SCr to be a significant predictor of better results in SF-36 subscales (*16*). Both of these papers support our results in this age category. It seems that for young people success of transplantation is one of the most important determinants of their health status. With good kidney function

TABLE 4. Multiple linear regression analysis of predictors of perceived health status in age group 40–59 years

	Mental component		Physical component	
Preditors	R^2	β, P	R^2	β, P
	47.4%		48.1%	
Primary education		−0.274*		−0.300***
Housekeeping activities		0.238**		0.194*
Side effects of IS		−0.584***		−0.605***

IS,– immunosuppression.
* $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$.

TABLE 5. Multiple linear regression analysis of predictors of perceived health status in age group ≥60 years

	Mental component		Physical component	
Preditors	R^2	β, P	R^2	β, P
	48.2%		34.6%	
Male gender		−0.194		
Elementary education		−0.369		−.0296
Housekeeping activities				0.170
Social support		−0.24		
D hospitalizations		−0.282		−0.453*
D operations		0.465		
SCr		−0.233		
Tx hospitalizations		−0.906**		
Diabetes mellitus		−0.797**		
Side effects of IS		−0.679*		−0.395*
Compliance		0.485**		

SCr, serum creatinine; IS, immunosuppression; D hospitalizations, number of hospitalizations during dialysis period; D operations, number of operations during dialysis period; Tx hospitalization, number of hospitalizations after transplantation.
* $P \leq 0.05$, ** $P \leq 0.01$.

their reintegration into society is successful and they report excellent perceived health status.

The explanation of variance in perceived health status is less clear in middle-aged patients compared to the younger ones (47.4% in the mental and 48.1% in the physical component). Both groups also present major differences in predictors of perceived health status, as predicted by education, housekeeping activities and side effects of immunosuppression in middle-aged kidney transplant recipients. Surprisingly, lower education is a negative predictor of health status only in this age category. One possible explanation is that the sample contained only 10 university-educated persons, all middle-aged. Kidney function is not a predictor of health status in this age category, in contrast to younger patients. Adverse effects of immunosuppressive medication are the only significant medical variable. A possible explanation is that younger patients evaluate good kidney function as the most important prerequisite for long life without dialysis.

Their major worries are connected with the fate of their graft (*8*). On the other hand, older patients accept even lower kidney function as long as they feel the same benefit in terms of their health status. So they rate unpleasant effects of treatment (*14*) and barriers in their everyday life (*15*) as more important.

The models of predictors of perceived health status among the oldest patients explained 48.2% of variance in the mental component and 34.6% in the physical component. Major variations in health status appear to exist in this age group and no variable is predominant. Despite the lower percentage of explained variance, perceived health status has a quite clear determinant: co-morbidity (number of pretransplant and posttransplant hospitalizations, presence of diabetes, side-effects of immunosuppression). These data are similar to the results of the study by Siegal et al. (*14*).

Participants in this study were recruited from two major transplant centers in Slovakia. The sample is representative and therefore the results may be extrapolated to the whole Slovak transplant population. However, perceived health status might be influenced by many cultural, ethnic and national variables, so additional larger multicenter studies are required to verify the results and allow their extrapolation to other populations. Another limitation of the study is that it had a cross-sectional design, so the results must also be verified longitudinally.

The most important medical variable for all age groups is the presence of unpleasant side-effects of immunosuppressive treatment. The consequence of this for clinical practice is that the adverse symptoms should be constantly evaluated by the transplant team, and major efforts should aim at decreasing their severity. Another important medical variable is kidney function, but only in the group of younger patients. Worry about viability of the graft and duration of its function is the major stressor for these patients (*8*, *27*). The major concern in this age category lies therefore in optimizing the kidney function, but with careful balance in the treatment to minimize side-effects. On the other hand, kidney function is not the predictor of perceived health status in older patients at all, as they benefit even with "less successful transplantation" with lower graft function. Instead, co-morbidity is more important for this age group, so the major implications for practice are connected with optimizing treatment and following up co-morbid diseases (mostly diabetes and cardiovascular morbidity). Of the non-medical variables, social support has a predominant effect on health status in younger patients, while ability to participate in everyday activities is the most important variable for older patients. These non-medical factors must be taken into account by the transplant team. Cooperation of medical staff with a psychologist, a social worker and the patient's family is necessary therefore in order to assure better quality of life as well as the patient's active rehabilitation and reintegration into society.

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